

Western's monthly energy efficiency and renewable energy newsletter dedicated to customer activities and sharing information on energy services.

## Nonprofit ski center warms up to heater demonstration

**L**a Plata Electric Association (LPEA), Convectair and Western's Equipment Loan Program are working together on a pilot project that may cut electric bills for a nonprofit organization today, and provide the co-op's customers with more choices for efficient heating tomorrow.

### Propane alternatives

In the southwest corner of Colorado, costly propane is often the default choice for heating. To encourage customers to install more economical electric systems, LPEA promotes electric thermal storage (ETS) units. The well-established program offers customers energy-efficiency credits for purchasing ETS heaters, and includes an off-peak rate schedule to make the system even more competitive with propane.

However, as LPEA Corporate Services Manager Mark Schwantes pointed out, there are some applications where ETS may not be the best choice. "A customer may not want to install a unit in a small space like a bathroom, for example," he said. "So we are on the lookout for heating systems that would give them more choices."

Convectair's convection heaters may be one such option. For the last few years, the co-op has been considering supporting the Convectair heating systems in member homes, with a pilot distribution of the systems in 2009. LPEA has received positive feedback from the residential customers who have them, Schwantes said, "But it never hurts to test a technology in different settings."

### Case study opportunity

A different setting presented itself last fall when the Adaptive Sports Association (ASA) called LPEA Energy Management Advisor Suzy Bynum. The Durango, Colo., chapter of Disabled Sports USA wanted to reduce heating costs in its ASA Dave Spencer Building at Durango Mountain Ski Resort without sacrificing skiers' comfort.



**Electrician Tim Kral checks the wiring for the new Convectair heating system being installed at the Adaptive Sports Association Ski Center as part of a pilot program with LaPlata Electric Association. (Photo by Lon Garrison)**

Bynum visited the facility with a local electrical contractor to size it for replacing outdated electric baseboard heaters with ETS units. "Usually, we recommend installing a few units in the most used areas and retaining the baseboard heating," she explained. "Unfortunately, that strategy came in over ASA's budget."

The center director, a satisfied residential Convectair cus-

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## Ski center *from page 1*

tomers, asked about the possibility of installing that system instead. Coincidentally, Convectair and Tri-State Generation and Transmission, LPEA's power wholesaler, had approached the co-op about doing some kind of pilot project. Bynum suggested to Schwantes that the center would be a good place for the case study. "It was a great idea," he said. "We could help out a local non-profit, and at the same time, get more real-life performance data to show to our customers who are interested in Convectairs."

Lon Garrison, Convectair U.S. sales manager, shared Schwantes's enthusiasm for the project. "The ASA does very worthwhile work, like the Wounded Warrior project that provides sports programs for severely wounded military veterans," he said. "Convectair is proud to be part of a project that will make the facility more comfortable."

### Energy Services Bulletin

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## Assess building

The case study began with a survey of the Spencer Building, a 1,430 sq. ft. log construction over a 430 sq. ft. uninsulated basement and crawl space. The log walls are eight inches thick and uninsulated, and the attic contains six inches of blown insulation. The existing heating system is 13 baseboard heaters with built-in mechanical thermostats, except in the main room where there is a wall thermostat. The office and the basement workshop rely on plug-in 120-volt portable heaters.

Bynum consulted with Western's Equipment Loan Manager Gary Hoffmann about which monitoring tools would be best for the job. The study plan called for collecting data on the heaters' electrical use and on the outdoor temperature at coordinated intervals before and after the change-out. The monitors would have to be programmable, and different models would be needed for the hard-wired heaters and the plug-in units. All of the tools would have to be self-contained. "It's not always possible for a power monitor to be hooked into a computer when it's collecting data from a system," said Hoffmann. "For those jobs, our tool library stocks monitors that retain data for later downloading."

LPEA borrowed two Dent Instrument Elite Pro data loggers and three Watts Up! PRO ES meters to monitor the heaters' energy use. For indoor and outdoor temperature monitoring and recording, Hoffmann recommended the Oregon Scientific WMR200A wireless weather station.

## Hooking up monitors

Shortly after the holidays, two Convectair technicians and an

electrician from Durango Electrical Services installed the monitoring equipment at the Spencer Building. A Dent data logger was placed on each breaker panel, rather than near the heaters. Installers traced each electrical circuit to determine which heaters were being monitored. "It helped that the electrician had bid the original retrofit job and had done research on the building's wiring," said Bynum.

The portable heaters were each plugged into Watts Up! power meters, and the weather station was set up to record the indoor and outdoor temperature. ASA staff and skiers also used the monitor's indoor display screen to find out about weather conditions on the slopes. While the monitors were being put in place, Garrison took pictures of the wiring. "It's typical of older buildings to need rewiring to accommodate modern electrical equipment," he observed. "So we are including a wiring upgrade as part of the installation."

Monitoring of the old heating system will continue through January. "We wanted the data to cover the system's performance through the coldest part of the year, and that's December and January in Durango," said Garrison.

## New system put to test

In February, traditionally a month of heavy snowfall and continued cold in Colorado, Convectair will install 15 new convection heaters throughout the building. The prior-generation Alto and Mezzo models were chosen for their "self-curing capacity," said Garrison. "Unlike a home, lots of people are in and out of the build-

*See SKI CENTER page 7*

## Tri-State agrees to host solar hybrid plant study

**C**ombining renewable generation with conventional fossil fuel generation seems like a great way to build a bridge to a clean energy future while helping utilities reduce their carbon footprint and diversify their energy portfolios. Those were the goals in mind when Tri-State Generation and Transmission Association and NV Energy agreed to host a demonstration project proposed by the Electric Power Research Institute.

The process EPRI intends to study involves introducing steam generated by a solar thermal field to the conventional power plant's steam cycle to offset some of the fuel needed to generate electricity. Tri-State's 245-megawatt Escalante Station in Prewitt, N.M., will represent coal-based plants in the study. The demonstration focusing on natural gas-fired plants will take place at NV Energy's 1,102-MW Chuck Lenzie Generating Station near Las Vegas.

### Much to gain

"We're pleased to partner with EPRI on this project," said Ken Anderson, executive vice president and general manager at Tri-State. "We are eager to learn more about the potential of this breakthrough technology that could further advance the efficiencies at one of our existing generating facilities, while simultaneously helping reduce our overall greenhouse gas emissions from the plant."

Solar thermal hybrid applications have many potential benefits to offer utilities. In addition to reducing greenhouse gas emissions, piggybacking solar thermal power on a conventional plant could help utilities meet state renewable energy mandates. Hybrid

plants will give utilities valuable experience integrating large-scale solar power into their generation mix, and provide a stable-cost resource over the long term. "The technology being studied would allow us a larger net output of electricity from Escalante Station, but without consuming more fuel to gain the additional electricity," Anderson added.

Also, the approach may hold the key to the intermittency challenge of integrating solar power onto the grid without compromising the reliability of supply. EPRI has received funding from the National Renewable Energy Laboratory (NREL) for a study to determine how many power plants could be candidates for solar augmentation.

### Expert support for project

Tri-State and NV Energy will receive support from EPRI throughout all phases of the demonstrations, which will be conducted in conjunction with building new solar thermal facilities. EPRI will rely on its expertise in solar technologies, steam cycles and plant operation, as well as past solar and fossil plant studies, including two on solar-augmented steam cycles completed this year at the host sites for the new demonstration projects. EPRI holds two patents in solar steam cycle optimization.

EPRI is forming collaboratives with



**The Electric Power Research Institute plans to study the use of solar-generated steam to augment coal generation at Tri-State's Escalante Station power plant in New Mexico. (Photo by Tri-State Generation and Transmission Association)**

plant owners and operators and other participants to provide data from these solar thermal hybrid projects to the industry and public. The collaborative will help select integration designs and conduct independent plant performance monitoring, evaluation and economic assessments of their planned projects.

Members of the collaborative include DOE's Sandia National Laboratory in Albuquerque, N.M., and the National Renewable Energy Laboratory (NREL) in Golden, Colo. During the case study, solar thermal research engineers from the laboratories will analyze the systems' performance, and look for ways to improve performance, reliability and service life of the systems and their key components.

"One of the cost-effective aspects of concentrated solar power is that it can be fitted to an existing power plant to make electricity in tandem with fossil fuels," said NREL's Mark Mehos, CSP principal program manager. "Existing plants already are connected

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*See SOLAR HYBRID PLANT STUDY  
page 8*

# Increase pumping system efficiency with free webinar

**N**o matter how good a tool is, it only works if people know of it and know how to use it, so Western and WSU Energy Experts are presenting a webinar Feb. 4 on Learning to Use Western's Online Pumping System Efficiency Calculator.

The live event is scheduled for 11 a.m. to noon, Mountain Standard Time, and is free to Western customers and their consumers. Space is limited, however, so don't wait to register.

Gil McCoy, P.E., a senior energy systems engineer at Washington State University, will talk about how to use the Pumping System Efficiency Calculator and answer live questions if time allows. Participants will also be able to submit questions through GoToWebinar's tool or with Western's Energy Experts question form.

## Major energy users

We expect participants to have lot of questions about systems that consume so much energy. According to USDA's 2003 Farm and Ranch Irrigation Survey, irrigation pumps cost farmers \$36 per irrigated acre or a national total of \$1.5 billion per year. Improving Pumping System Performance, a guidebook from DOE's Industrial Technologies Program (ITP), states that pumps represent 27 percent of the electricity used by industrial systems.

The tough economy is driving business and agricultural consumers to look for ways to cut costs, noted Energy Services Manager Ron Horstman. "In the past few months, the online calculator has been getting

hundreds of hits," he said.

In its publication Energy Efficiency Tips for Irrigators, the National Sustainable Agriculture Information Service notes that most irrigation systems are not as efficient as they should be. A Kansas study found that irrigation systems that are not properly sized, adjusted and maintained average about 40 percent higher fuel use. On the industrial side, ITP's fact sheet Test for Pumping System Efficiency (247 kb) shows how system testing can uncover thousands of dollars in energy savings.

Energy Experts created the calculator to help utilities control their irrigation and industrial loads, and to help large accounts identify inefficiencies that could be driving up their operating costs. Pumping plant operators can use this Energy Services tool to assess their systems, schedule pumping and estimate potential energy savings from energy-efficiency improvements. The National Center for Appropriate Technologies has found that in most cases, one equipment change or repair can quickly pay for itself in energy savings alone.

## Energy Expert presents

The webinar will cover a general



**According to the U.S. DOE, about 27 percent of all energy consumed by motor-driven equipment in manufacturing facilities is used to operate pumps. (Photo by National Renewable Energy Laboratory)**

overview of the pumping calculator and include demonstrations using data from real pumping systems. McCoy provides technical assistance and energy auditing services to both industrial and public sector clients for Western's Energy Experts hotline. His areas of expertise include energy-efficiency measures and optimization of industrial systems and he served as lead engineer for development of several software products including MotorMaster+ motor energy management software.

Horstman, who will introduce the webinar, strongly urges utilities with significant agricultural or industrial loads to register for the event, and to invite their consumers to join in. "If yours is a summer-peaking utility due to irrigation, or your system has industry that contributes to your peak demand, give us an hour of your time and we will give you an indispensable tool," he said. "The price is right, and your customers will thank you." ⚡

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## Technology Spotlight:

# Building a project team for solar photovoltaics

**A**s with many types of projects, the most successful solar photovoltaic (PV) installations are the result of team effort, with each team member contributing their particular expertise and coordinating their work with the others. A builder can find many references on how a PV system works, the equipment involved and other technical aspects. Beyond technology, however, a builder needs a project team that is aware of special considerations involved in coordinating and planning a successful PV project.

## The team

In a photovoltaic project, the team may include an electrical contractor or electrician, roofing and mechanical contractors, a PV system designer or vendor, the building owner's utility and a building or electrical inspector.

Each brings a particular expertise. For example, the person most familiar with electrical codes—the electrical contractor or electrician—may be unfamiliar with the specifics of PV system installations. On the other hand, the PV system designer or vendor is an expert on PV system requirements but may not be familiar with the intricacies of the National Electric Code (NEC).

Further, there must be coordination between all subcontractors to ensure that, for example, the solar array is not inadvertently shaded by a vent stack, attic fan or skylight. Vents and fans can be installed on the north side of the roof to avoid interference with the solar array. The roofing contractor must coordinate with those

installing the PV system in mounting the array.

Before purchasing any equipment, the project manager should call the utility to determine its requirements for interconnection with the grid.

Enlisting the local 'Authority Having Jurisdiction' (usually a building or electrical inspector) early on as a member of the project team will also contribute to the success of the project.

Even if the PV system is not installed during construction of the building, the general contractor might coordinate with the electrical subcontractor to install those runs of conduit that would be difficult to do later as a retrofit, thus making the building "solar ready."

## Solar or electrical?

A general contractor may have to choose between hiring an electrical subcontractor or a solar subcontractor to install the PV system. A good solar contractor will have the expertise in solar PV systems, plus qualified electricians on staff. On the other hand, the general contractor may prefer an electrical contractor with whom he or she has



**Finding contractors with an understanding of the specifics of solar panel installation is essential to a successful project. (Photo by National Renewable Energy Laboratory)**

a longstanding relationship.

An experienced electrical contractor who goes the extra step in researching PV's special requirements will generally be qualified to install a PV system. The builder may need to impress upon an electrical contractor that PV systems do have unique requirements and manufacturer's directions that must be studied and strictly followed.

## Preconstruction meeting

It is quite typical for different contractors to perform the PV system installation and general electrical work. It is a good idea to arrange an on-site preconstruction meeting with the electrician and the solar installer to discuss where one job ends and the other begins.

## More information

■ *Solar Electric System Design, Operation and Installation: An*

*See TECHNOLOGY SPOTLIGHT page 8*

## Web site of the month:

# New, improved Equipment Loan Program

**W**eb sites, like homes, occasionally need to be updated to fit the changing needs of the occupants, and so, like a growing family, the Equipment Loan Program is starting off the New Year with a big remodeling project.

As one of Energy Services' most popular programs, the Equipment Loan Web site gets a lot of use. But unlike a room with scuffed walls and worn carpet, the wear and tear shows up on Program Manager Gary Hoffmann, who fields the phone calls and e-mails from Western customers who can't find the answers they need. "People want to know which tools to borrow for specific jobs, what kind of experience they need to operate them, even what the tool looks like so they can be sure they're getting what they ordered," said Hoffmann.

With more and more utilities exploring efficiency measures and borrowing the equipment to collect data, it was clear that the Equipment Loan "house" needed to expand. Luckily, it is easier to add rooms, and even change the underlying structure, on a Web site than it is on a house.

### Update existing pages

The old site consisted of a home page, available equipment, FAQ and an online order form. The home page, the "front door" that ushers visitors into the rest of the site, and "FAQ," which tells visitors how the

program works, needed only a little touch up. Available equipment, on the other hand, was like a storage closet with all the tools packed in boxes. The page was nothing more than a laundry list of tool names under the appropriate category with a few links to pictures. Even the page name sounded dull.

Customers needed to find out what the different types of tools do, and they needed to see what they were borrowing. What customers needed was a Tool Gallery. The page begins with a glossary of the tool categories, so visitors can begin the selection process right away. The categories are linked to the illustrated list that displays a picture of the tool right next to its name.

### Help selecting tools

A picture may be worth a thousand words, but a few well-chosen words can bring the picture into focus. In addition to the Tool Gallery, there is a separate page for each equipment category—educational kits, energy audit equipment, infrared cameras, power meters—with more details to help visitors narrow down their choice of tool. Information such as the tool's applications, the skill level needed to operate it, special features and the audience for the data the tool collects is organized in tables.

It is not unusual for Western customers to turn to the Equipment Loan Program simply because one of their consumers is calling for

help. "What's your problem?" is for visitors who have a job, but no tool, in mind. Drawn from utilities' real-life experiences, the "problems" are linked to the tool page that may offer a solution. Of course, customers can still call Hoffmann for advice, and we can add those problems to the page to help the next visitor.

### Relocated navigation

As is often the case with home improvement, we had to move some elements to make room for new features. The gray navigation bar on the right side of the Equipment Loan pages took up valuable real estate, squeezing all the new information down the middle of the page. Placing those page links in a drop-down menu under "Borrow equipment" in the left navigation bar tidied up the look of the pages and reduced the amount of scrolling needed to read all the content.

Like proud homeowners, the Equipment Loan Program is eager to show off its new, improved site to visitors. We want our customers to look around our new rooms, make yourselves comfortable and suggest other changes that could make the site work better for you. The great thing about a Web site is that it is always open to improvement. ⚡

Want to know more?

Visit [www.wapa.gov/es/pubs/esb/2010/feb/feb105.htm](http://www.wapa.gov/es/pubs/esb/2010/feb/feb105.htm)

## Ski center *from page 2*

ing all the time,” he explained. “Also, high altitude can affect a heater’s performance, so these units need to be able to correct the temperature without being constantly, manually readjusted.”

Garrison acknowledged that the case study is putting the Convectair through its paces. “The demands are definitely more sophisticated than residential

heating,” he said, “but it will provide valuable documentation on product performance under extreme conditions.”

The power monitors will remain on the new heaters through the rest of the ski season, and Schwantes anticipates a final report being available around late April or May. “Ultimately, we want to know if the Convectair can

save our customers money over conventional baseboard heaters,” he said.

Hoffmann is looking forward to seeing the results, too. “Projects like this produce information Western customers can share with each other,” he said. “And they show what customers can do with resources from the Equipment Loan Program.” ⚡

Want to know more?

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## ECONOMIC DEVELOPMENT CASE STUDIES *for* WIND

**Free webinar**

**Feb. 17**

**10:00-12:00 p.m. MST**

Explore how communities and utilities benefit from the development of wind projects. Presenters will offer case studies as well as models communities can use to estimate local economic benefits.

To register, contact Ryan Harry; BCS, Incorporated; at 303-425-6800.

## Upcoming deadlines:

- Feb. 4 – EPA Source Reduction Assistance Grant proposals
- Feb. 15 – Applications for DEED utility grant & student research grants/internships
- March 9 – Applications for Community Action for Renewed Environment (CARE) grants
- April 14 – New Era Rural Technology Competitive Grants

Keep up with the latest news about Western customers and programs that can help your utility manage its energy future—subscribe to Energy Services News RSS feed, <http://www.wapa.gov/rss/esnews.xml>.

## Solar hybrid plant study *from page 3*

to the transmission grid, making the technology relatively easy for utilities to work with. That can only help to expand the use of renewable energy,” he said.

### Greater goal

Last year, Tri-State hosted the feasibility study that preceded EPRI’s proposed solar-augmentation demonstration. The power wholesaler is also one of several other utilities participating in an EPRI-led solar-to-steam study project applied at natural gas-fueled, combined-cycle power plants in Arizona and Nevada. Such projects play a central role in Tri-State’s Greenhouse Gas Management Roadmap, submitted

to the Colorado Governor’s Energy Office in June 2009.

The roadmap is Tri-State’s status report on its continuing efforts to manage risks posed by potential mandates limiting greenhouse gas (GHG) emissions. In a press release that accompanied the roadmap, Anderson observed that developing cost-effective energy and environmental technologies would be critical to meeting emission reduction goals.

Roadmap initiatives and programs span many areas of Tri-State’s operations, including energy efficiency; renewable energy; system efficiency; research, development

and demonstration and resource planning. Roadmap programs are expected to have high potential for GHG management and are expected to reveal near-term opportunities and long-term strategies.

Even in the face of a tough economy, Anderson asserted that Tri-State does not plan to shy away from making critical investments in new programs and technologies. “As scientific progress is made, Tri-State will seize new opportunities to further cultivate the local resources that enhance our power production and delivery system in order to bring more value to our member systems,” he said. ⚡

Want to know more?

Visit [www.wapa.gov/es/pubs/esb/2010/feb/feb102.htm](http://www.wapa.gov/es/pubs/esb/2010/feb/feb102.htm)

## Technology Spotlight *from page 5*

*Overview for Builders in the U.S. Pacific Northwest* (580 kb pdf)—Washington State University Extension Energy Program, October 2009.

- *A Guide to Photovoltaic (PV) System Design and Installation* California Energy Commission, 2001—This guidebook provides design considerations and installation guidelines to installers of photovoltaic systems.
- *International Association of Electrical Inspectors*—The IAEE’s online bimonthly series “Perspectives on PV” covers

many practical issues on photovoltaic systems, including installation tips, equipment, code requirements and inspection. The current edition and archived articles are available. (In browsing the archives, note you must select both the month on the calendar and the year from the list below the calendar.)

- *SolarBuzz.com*—Visit Solarbuzz’s “Expo” to find contacts for solar PV installers, and manufacturer contacts for solar modules, inverters, batteries and charge controllers. The Solar Module

Retail Price Environment carries information on typical system component prices.

- *U.S. DOE Office of Energy Efficiency and Renewable Energy (EERE)*—EERE’s Web site on “Connecting Your System to the Electricity Grid” has information on equipment required to connect your system to the grid, grid connection requirements of your power provider and state and community codes and requirements. ⚡

Want to know more?

Visit [www.wapa.gov/es/pubs/esb/2010/feb/feb104.htm](http://www.wapa.gov/es/pubs/esb/2010/feb/feb104.htm)